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ABSTRACT

In an attempt to address the issue of bimodal coordination of featural stimuli, the sensitivity of 3-month-old infants to the auditory and visual components of male and female stimulus configurations was examined. Measures were made of the infants' visual attention to a male or female face while they listened to a male voice, female voice, or to music. It was expected that differential attentiveness to the male or female face during the appropriate, corresponding auditory condition would occur, thus demonstrating the ability of young infants to organize featural stimuli bimodally. A 3 (auditory stimulus) x 2 (face) repeated measure of variance analysis yielded a significant auditory stimulus effect; there was more visual attention to both faces while the female voice was playing. However, during the female voice condition there was significantly more visual attention to the female face than to the male face. Possible reasons for the clear-cut bimodal processing of female, but not male, stimulus configurations are discussed. (Author/MF)

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Bimodal Schemata in Three-Month-Old Infants

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Bimodal Schemata in Three-Month-Old Infants

Following research which established the competence of young infants in processing information through single modalities, increasing attention is now being directed towards multimodal capacities in early infancy. Of particular interest has been the relationship which exists between vision and audition. Earlier efforts to examine this relationship emphasized the effects which auditory input had upon visual responsiveness. Self (1974), for example, reported that 5-6 week-old infants who had habituated to a visual stimulus demonstrated recovery to that stimulus when music was introduced. Further, Mendelson and Haith (1976) found that sounds dramatically affected the scanning patterns of 1-4 day-old infants. Such findings indicate that, even during the neonatal period, stimuli which are perceived in one modality influence behaviors in another modality.

Other studies addressing the relationship between audition and vision in early infancy have examined the extent to which information from both modalities is organized. Such research has generally explored one of three parameters of this organization, specifically the spatial, temporal, or featural dimensions of auditory and visual stimuli. With regard to the spatial dimension, Aronson and Rosenbloom (1971) reported that 2-month-old infants became upset upon observing their mothers talking to them, but with their voices spatially dislocated from their faces by means of a loudspeaker. Temporal organization of auditory and visual stimuli primarily have been examined by Spelke (1976, 1979); her data suggest that 4-month-old infants detect temporal synchrony between visually- and acoustically-specified events.

Featural coordination between auditory and visual input has received considerably less research attention. For example, as Mendelson and Haith (1976) note, it is not known whether young infants are sensitive to certain stimulus combinations, such as voice and face. In one of the few attempts to test this possibility, Cohen (1974) measured attentional behaviors of 5- and 8-month-old infants toward presentations of face-voice matchings and mismatchings of their mother and a stranger. Cohen's findings were equivocal, with only some of the 8-monthers appearing to exhibit specific auditory-visual expectations, and none of the 5-month-old group doing so. Given the positive findings of Aronson and Rosenbloom (1971) and Spelke (1976, 1979) regarding the ability of younger infants to organize spatial and temporal information bimodally, Cohen's results are somewhat surprising.

The present study attempted to further address the issue of bimodal coordination of featural stimuli. The specific research question involved the sensitivity of 3-month-old infants to the auditory and visual components of male and female stimulus configurations. In order to assess thie sensitivity, measures were made of 3-month-old infants' visual attention to a male or female face while listening to either a male voice, a female voice, or to music. It was expected that differential attentiveness to the male or female face during the appropriate, corresponding auditory condition would occur, therefore demonstrating the ability of infants this age to organize featural stimuli bimodally.

To test this hypothesis, parents of infants from 2½ to 3½ months of age were asked to bring their infants into the laboratory; subjects were obtained through the birth announcements of a local newspaper. All infants who participated were full-term, and had experienced a normal post-natal course. Of the 57 infants tested, 17 failed to remain in an alert, non-

active state for the procedure; in addition, four subjects were excluded from the data analysis due to inadequate interobserver reliability. Therefore, the ultimate sample consisted of 36 infants (18 males, 18 females). Ages of the infants ranged from two months and fifteen days to three months and twenty-four days, with a mean age of three months and two days.

During the experimental procedure, infants were randomly assigned to one of three experimental groups, each of which consisted of six males and six females. Then, each infant was placed in a booth which was enclosed by black curtains. The infant's mother positioned her infant such that he/she was facing a screen on which stimuli were to be presented; the distance between the infant and stimuli was approximately 12 inches. The only light in the room originated from behind the stimuli; these stimuli consisted of two 8 X 12 black and white photographs, one of an adult male and one of an adult female. The stimuli were similar with respect to contrast; also, both photographs showed smiling faces.

After placing the infant in the booth, the mother quickly stepped out and the procedure began. By raising and lowering a black curtain, five 30-second presentations of the faces were made; simultaneously, each infant heard one of three auditory stimuli: 1) a male voice reading R. L. Stevenson's poem "The Shadow"; 2) a female voice reading the same poem; or 3) a musical segment from Browne's "Linda Paloma" (this segment was reasonably complex so as to be comparable to the voices). Each auditory stimulus had been recorded previously and was 30 seconds in length. A trial (indicated by the onset of the auditory stimulus) began when the infant looked at one of the stimuli. In order to control for a position effect, the position of the faces was switched on each trial; also, for each subject, the initial position of the faces was randomly determined.

Two observers, one of whom was naive as to the purposes of the study, recorded the visual attention of the infants. Positioned such that they could detect discrete infant eye movements, these observers noted using an event recorder the total amount of time that the infants looked at each of the two stimuli during each trial. In addition, each observer confirmed that infants were in an alert state for each trial, using Brazelton (1973) definitions.

Prior to data analysis, calculations of interobserver reliability between the two observers were made for each subject; this reliability was determined by dividing the number of seconds which the observers agreed by the total number of agreements plus disagreements. Only those data for infants on whom reliability exceeded 80% were included in the data analysis; according to this criterion, four subjects were excluded due to unreliability of the data. Mean reliability across the subjects included in the data analyses was 94%.

In addition, due to problems in interpreting data because of fluctuating infant states, only those infants who maintained an alert, non-active state (Brazelton, 1973) for all five trials were included in the data analysis; these subjects comprised 68% of the total infants tested.

Preliminary analyses revealed no significant sex differences in this sample of infants; therefore, data were collapsed across male and female subjects for all subsequent analyses. Then, a 3 (Auditory Stimulus) X 2 (Face) repeated measures of analysis of variance was conducted, using the total time across the five trials which infants spent looking at the two faces as the dependent measure. As Table 1 indicates, this analysis yielded a significant auditory stimulus effect, $F(2, 33) = 4.17$, $p < .05$;

specidically, as can be seen from the marginal means in Table 2, there was more visual attention to both faces while the female voice was playing. No other main or interaction affects achieved significance.

In order to test a priori hypotheses, comparisons were made, using Dunn's procedure, of infant looking at the male and female faces under the male voice condition and the female voice condition. These comparisons revealed that, during the female voice condition, there was significantly more visual attending to the female face than to the male face. This effect is reflected in the means in Table 2; also, it can be seen in this table that, for the male voice condition, there was a non-significant tendency for the infants to attend to the male face.

Clearly, the results of the present study do not offer extensive support for a bimodal processing explanation of the behavior displayed by this sample of infants. If such were the case, a significant interaction between auditory condition and facial attention would have been observed. Still, as the individual comparisons demonstrated, some intriguing components of this processing were present, with specific reference to the significant attention to the female face during the female voice condition. Together with the non-significant tendency of the infants to look at the male face during the male voice condition, this finding certainly suggests that some matching of auditory-visual stimuli was taking place.

However, an appropriate question at this point concerns reasons for the clear-cut bimodal processing of female, but not male, stimulus configurations. One explanation would be a relatively greater responsiveness to female attributes, and, indeed, this explanation is supported by several findings of the present study. First, infants showed a tendency to attend to the female face even during the neutral auditory condition;

in combination with the significant looking at the female face during the female voice condition, this tendency resulted in greater overall attention to the female face.

Also indicative of greater responsiveness to female characteristics was the effect which the female voice had upon overall visual attention. As it will be recalled, infants looked at both faces significantly more when the female voice was playing in comparison with the male voice or the neutral auditory condition.

While findings such as these indeed indicate a relative saliency of female as compared to male characteristics for this group of infants, a discussion of similar findings is lacking in previous literature. As such, an explanation for this saliency must be somewhat speculative. For instance, it is worth noting that all of the infants in this research had their mothers as primary caregivers. Therefore, it may be that the infants generalized the facial and/or vocal features of their primary caregiver to the experimental stimuli.

To summarize, the present research revealed some evidence of bimodal processing by 3-month-old infants. In addition, it is likely that more convincing support was not obtained due to a relatively greater responsiveness to female as compared to male attributes. As such, future research addressing similar questions must take into account any preconceived biases which the infant may bring into the experimental situation.

In conclusion, the present data are compatible with recent research which depicts the young infant as a bimodal processer of information (e.g., Aronson and Rosenbloom, 1971; Spelke, 1976, 1979); further examination of the bimodal processing of featural stimuli by infants this age

seems warranted based upon these data. A final comment involves the higher responsiveness to female as opposed to male characteristics. Clearly, this particular aspect requires corroboration by future studies; still, the documentation of this finding may certainly be viewed as a significant product of the current research.

Table 1

3 (Aud. Stim.) X 2 (Face) ANOVA Results

Source	SS	DF	MS	F
AS	620.38	2	310.18	4.17*
SS AS	245296.60	33	74.33	
FC	747.56	1	747.56	1.81
FC X AS	1730.75	2	865.38	2.10
SS FC X AS	13598.69	11	412.08	

*p < .05

Table 2

Mean time (sec.) looking at male and female face under 3 auditory conditions

FACE

AUDITORY STIMULUS	Male	Female	
Music	49.42	57.58	53.50
Female	51.92	69.42	60.67
Male	60.75	54.42	57.58
	54.10	60.47	

References

Aronson, E. & Rosenbloom, S. Space perception in early infancy: perception within a common auditory-visual space. Science, 1971, 172, 1161-1163.

Brazelton, T. B. Neonatal Behavioral Assessment Scale. National Spastics Society Monographs, Philadelphia: L. B. Lippincott Co., 1973.

Cohen, S. E. Developmental differences in infants' attentional responses to face-voice incongruity of mother and stranger. Child development, 1974, 45, 1155-1158.

Mendelson, M. J. & Haith, M. M. The relation between audition and vision in the human newborn. Monographs of the Society for Research in Child Development, 1976, 41 (4, Serial No. 167.).

Self, P. A. Control of infant visual attending by auditory and interspersed stimulation. In F. D. Horowitz (Ed.), Visual attention, auditory stimulation, and language discrimination in young infants. Monographs of the Society for Research in Child Development, 1974, 39 (5-6, Serial No. 158.)

Spelke, E. Infants' intermodal perception of events. Cognitive psychology, 1976, 8, 553-560.

Spelke, E. Perceiving bimodally specified events in infancy. Developmental psychology, 1979, 15, 626-636.